

FIRST REPORT OF *ALEXANDRIUM MINUTUM* HALIM IN A MEDITERRANEAN LAGOON

M.G. GIACOBBE and G. MAIMONE

Istituto Sperimentale Talassografico - Consiglio Nazionale delle Ricerche
Spianata San Raineri 86, 98122 Messina, Italy.

ABSTRACT. - The occurrence of *Alexandrium minutum* Halim (Dinophyceae) in a lagoon of Sicily (Italy) and its main morphological features are described. This small-sized dinoflagellate, which can produce Paralyzing Shellfish Poison (PSP), was found for the first time in April 1990 in inshore waters of Sicily - communicating with the Straits of Messina - where small-scale shellfish farming is practised. The highest cell concentrations were recorded in May 1991 (9×10^4 cells l^{-1}) in the surface layer, but no PSP human symptoms were reported. This month, *A. minutum* cells were widely spread throughout the waters and 2% of the algal population was constituted of chains of two cells.

RÉSUMÉ. - L'apparition d'*Alexandrium minutum* Halim (Dinophyceae) dans une lagune située en Sicile (Italie) et ses principales caractéristiques morphologiques sont décrites. Ce dinoflagellé de petite taille, qui peut produire des toxines paralysantes (PSP), a été observé pour la première fois en avril 1990 dans une zone littorale de la Sicile - communiquant avec le Détroit de Messine - où est implantée une petite exploitation de coquillages. Les concentrations cellulaires les plus élevées ont été reportées en mai 1991 (9×10^4 cellules l^{-1}) en surface, et n'ont donné lieu à aucune observation de symptôme paralytiques parmi la population. Durant ce mois, les cellules de *A. minutum* étaient largement répandues dans l'eau et 2% de la population algale était constitué de chaînes de deux cellules.

KEY WORDS. - *Alexandrium minutum*, first report, Ganzirri lagoon, the Straits of Messina.

INTRODUCTION

There have been different reports of the occurrence in Italian waters of dinoflagellates belonging to *Alexandrium* genus, previously called "*tamarensis/catenella*" morphogroup of *Gonyaulax*, both in the Tyrrhenian Sea and the Adriatic Sea (see Boni, 1992 for a review). Lesser information can be found, however, in literature relative to the presence of this algal genus along the coastline of Sicily (Giacobbe *et al.*, 1993). In this paper we report for the first time the detection of *Alexandrium minutum* Halim (synonym: *A. ibericum* Balech, 1985) in a lagoon of Sicily, communicating with waters of the Straits of Messina, and describe the main morphological features of our specimens. This dinoflagellate, type species of the genus *Alexandrium*, was first reported to produce both red tides and Paralyzing Shellfish Poison (PSP) in South Australian waters (Hallegraeff *et al.*, 1988). We observed its presence in the lagoon during a survey on potentially-toxic microalgae, like *Dinophysis* spp.; the latter (mainly *D. sacculus*) occur, in fact, in brackish environments of the Tyrrhenian coast (Giacobbe & Maimone, 1991; Giacobbe *et al.*, 1992), growing in spring and autumn.

MATERIALS AND METHODS

A monthly sampling cycle was carried out, from April 1990 until December 1991, for algal monitorings in the lagoon of Ganzirri (Fig. 1), covering about 34 ha; this area (maximum depth: 6.5 m) is connected both to the Straits of Messina and to another lagoon through two small canals. Illegal, small-scale shellfish farming is practised in the area. Algal samples were collected from the surface and near-bed waters using both Go-flo General Oceanic bottles and fine-meshed (20 μ m) nets; the samples were preserved with neutralized formaldehyde to a final concentration of 2% and the cell counts were made using the Utermöhl method (1958).

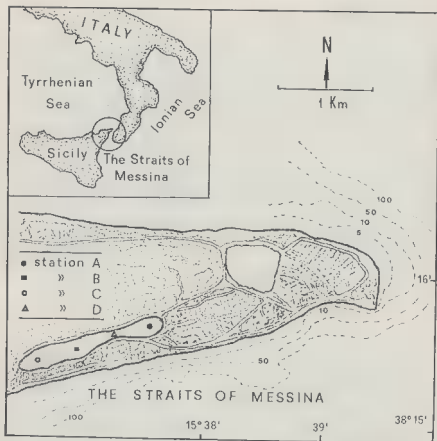


Fig. 1 - Map of the Ganzirri Lagoon (Italy) and sampling stations.

The taxonomic features of *Alexandrium* Halim were revealed by morphological examination, under inverted microscope (Axiovert 35 - Zeiss), of empty thecae present in the samples, or by cell isolation and dissection with 7% sodium hypochlorite solution. The algal cells were stained with trypan blue according to Taylor (1978).

Drawings of the thecal plates were made from the slide projection of the specimens photographed.

MORPHOLOGY OF THE CELL COVERING

A specific identification was made on the basis of the following morphological features: conical hepitheca in ventral view; hypotheca flattened obliquely by sulcus (Fig. 2b); globular or oval shape of the whole theca; small size: 16-25 μm in length, 19-25 μm in width ($n=30$); absence of both spines and evident plate ornamentation, even if a heavy reticulation of the hypothecal plates has been reported in specimens from coastal waters of the Tyrrhenian Sea (Montresor *et al.*, 1990). The plate formula was found to be Po, 4', 6'', 6C, 8S, 5'', 2''' as shown, in part, in Figure 3 (a-d); this tabulation does not include, however, the 1 or 2 possible accessory sulcal platelets, which are reported to be very small in size ($\leq 1\mu\text{m}$) in this species (Balech, 1989). The epitheca of the specimens selected has a rather rhomboidal 1' plat (Fig. 2c); the latter has a ventral pore in its right anterior side and a direct connection to the apical pore plate (Po) which is rather drop shaped or triangular (Figs. 2d, 3a/c). The 6'' precingular plate is narrow, with a slightly concave left back edge (Figs. 2c, 3a). Growth bands between the adjacent plates can be seen in some specimens.

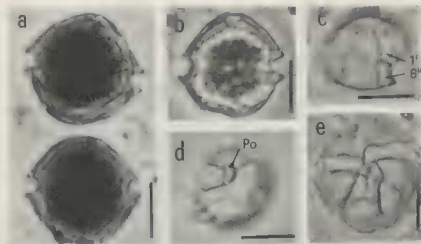


Fig. 2 - Light micrographs of *Alexandrium minutum* specimens from the Ganzirri Lagoon. (a) A pair of cells after disconnection; (b) single cell with antapical margin flattened obliquely; (c) view of the epitheca showing the 1' and 6'' plates; (d) connections of Po with the apical plates; (e) empty theca with some visible sulcal plates. Scale bars = 10 μm .

The cingulum is deeply excavated, left-handed, and displaced of one cingular width. The hypotheca has the first postcingular plate (1'') pointed by anterior sulcal plate (S.a.). The sulcus is large (Fig. 2e), with small lists and eight quite visible sulcal plates (Fig. 3d); among these, the anterior one (S.a.) is equal in length and width, so

differing from that of *A. lusitanicum* Balech, a similar species occurring in the Adriatic Sea (Honsell *et al.*, 1992). The posterior sulcal plate (S.p.) - greater in width than length - has an indentation of the right anterior margin, also observed by Balech (1989) in specimens selected from Alexandria Harbour - Egypt, the type-locality. Neither anterior nor posterior attachment pores were observed.

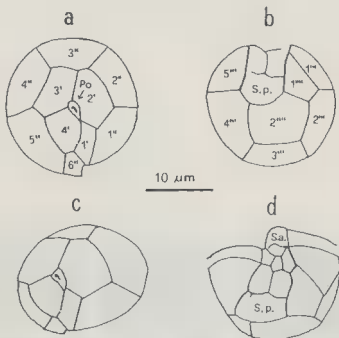


Fig. 3 - *A. minutum* thecal plates. (a) Apical view; (b) antapical view; (c) epithecium with triangular Po plate; (d) hypotheca and sulcal plates. S.a. = anterior sulcal plate; S.p. = posterior sulcal plate.

SEASONAL DISTRIBUTION

Peaks of *A. minutum* concentrations occurred in the surface waters of the lagoon in April/May and August. This species was found in low densities, also in other periods of the year (July, November and December), as resulted both from the bottle and net sample analyses; the latter revealed, however, the only presence of larger-size forms since the smaller ones could not be caught by our nets.

In May 1991 *A. minutum* cells were widely spread throughout the waters, with maximum concentrations of 90 000 cells l^{-1} in the narrowest part of the area (station D, surface layer); the water temperature and salinity were 21°C and 30‰, respectively. During this month, 2% of *A. minutum* natural population was found forming chains of two cells (Fig. 2a), as was infrequently observed also by Hallegraeff (1988) in South-Australian waters. Our specimens forming two-celled chains, broke loose as soon as the samples were slightly shaken. It seems, actually, this species has unusual chain

forming, as was observed along the French Atlantic coast, where high cell amounts can be found in summer (Lassus & Bardouil, 1988); chain-formation was not described either by Zaghloul & Halim (1992) in Egyptian shallow waters were non-toxic red tides - due to outbreaks of *A. minutum* - reappear every year in May.

CONCLUSIONS

Although no red-discolourations of the eutrophicated waters of the Ganzirri Lagoon are observed, fish mortality has sometimes been reported (Magazzù *et al.*, 1991). Further studies, therefore, will have to be made to check the possible presence of indigenous *A. minutum* populations in the waters, of sediment resting cysts and the production of neurotoxins (mainly gonyautoxins) by our specimens.

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